

# Evaluating Expressions

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 24

## Quick Review

To **evaluate** an expression: substitute the given value(s) for each variable — always in *parentheses* — and then follow the order of operations. The parentheses matter most when the input is negative:  $x^2$  at  $x = -3$  should look like  $(-3)^2 = 9$ , not  $-3^2 = -9$ . The two answers differ by sign, and the difference depends entirely on whether the negative is inside or outside the power. For **function notation**  $f(x)$ , evaluating  $f(a)$  just means swap every  $x$  for  $(a)$  and simplify. For **fractions**, treat the numerator and the denominator as their own little problems, finish each, then divide. For **absolute value**, simplify everything inside the bars first, then apply the absolute value.

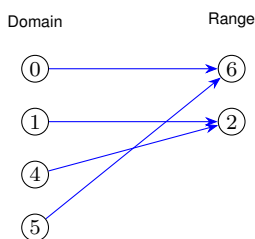
## PRACTICE

Evaluate each expression at the given value(s). Show your work.

1.  $f(x) = 3x^2 - 2x + 5$ ;  $f(-2)$  \_\_\_\_\_
2.  $\frac{a+b}{a-b}$ ;  $a = 5$ ,  $b = 3$  \_\_\_\_\_
3.  $f(x) = |3x - 4| + 2$ ;  $f(-1)$  \_\_\_\_\_
4.  $\frac{x^2 - 9}{x + 3}$ ;  $x = 5$  \_\_\_\_\_
5.  $A = P(1 + r)^t$ ;  $P = 1000$ ,  $r = 0.05$ ,  $t = 2$  \_\_\_\_\_
6.  $g(x) = -x^2 + 4x - 7$ ;  $g(-2)$  \_\_\_\_\_
7.  $h(t) = 60 - 16t^2$ ;  $h(1.5)$  \_\_\_\_\_
8.  $f(x) = 3x^2 - 2x + 1$ ;  $f(2)$  \_\_\_\_\_
9.  $f(x) = 3x^2 - 2x + 1$ ;  $f(0)$  \_\_\_\_\_
10.  $f(x) = 3x^2 - 2x + 1$ ;  $f(-2)$  \_\_\_\_\_
11. The table gives values of  $f(x) = 3x^2 - 2x + 1$  at several inputs. The pattern stops just before  $x = 3$ . Compute  $f(3)$ . \_\_\_\_\_

$x$	-1	0	1	2
$f(x)$	6	1	2	9

12.  $H(t) = -12t^2 + 36t + 18$ ;  $H(1.5)$  \_\_\_\_\_
13.  $\frac{2p^2 - 3q}{p + q}$ ;  $p = -4$ ,  $q = 2$  \_\_\_\_\_
14.  $2x^2 - 3xy + y^2$ ;  $x = -2$ ,  $y = 4$  \_\_\_\_\_
15. The mapping diagram shows inputs sent to outputs by  $f(x) = x^2 - 5x + 6$ . One arrow is missing: where does the input 2 go? Compute  $f(2)$ . \_\_\_\_\_



16. The table gives values of  $f(x) = x^2 - 5x + 6$  near  $x = 3$ . Use the rule to fill in  $f(3)$ . \_\_\_\_\_

$x$	0	1	4	5
$f(x)$	6	2	2	6

17.  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ ;  $(1, 2)$  to  $(4, 6)$  \_\_\_\_\_

18.  $f(x) = 2|x - 3| + 1$ ;  $f(7)$  \_\_\_\_\_

19.  $\frac{x^3 + 1}{x + 1}$ ;  $x = 2$  \_\_\_\_\_

20.  $g(x, y) = x^2 + 2xy + y^2$ ;  $x = 3$ ,  $y = -1$  \_\_\_\_\_

### ◆ Word Problems

21. A ball is dropped from a 60-foot ledge. Its height above the ground at time  $t$  seconds is  $h(t) = 60 - 16t^2$ . \_\_\_\_\_  
Find the height at  $t = 1.5$  seconds.

22. A savings account uses  $A = P(1 + r)^t$ , where  $P$  is the principal,  $r$  is the annual rate as a decimal, and  $t$  is \_\_\_\_\_  
years. Find  $A$  when  $P = \$1,000$ ,  $r = 0.05$ ,  $t = 2$ .

23. A drone's height is  $H(t) = -12t^2 + 36t + 18$  feet, where  $t$  is seconds. What is  $H(1.5)$ ? \_\_\_\_\_

24. The expression  $\frac{2p^2 - 3q}{p + q}$  comes from a sensor calibration. Evaluate it when  $p = -4$  and  $q = 2$ . \_\_\_\_\_



## Answer Keys

- |            |                |
|------------|----------------|
| 1. 21      | 13. -13        |
| 2. 4       | 14. 48         |
| 3. 9       | 15. 0          |
| 4. 2       | 16. 0          |
| 5. 1102.50 | 17. 5          |
| 6. -19     | 18. 9          |
| 7. 24      | 19. 3          |
| 8. 9       | 20. 4          |
| 9. 1       | 21. 24 ft      |
| 10. 17     | 22. \$1,102.50 |
| 11. 22     | 23. 45 ft      |
| 12. 45     | 24. -13        |

## Step-by-Step Explanations

- Swap every  $x$  for  $(-2)$ , parentheses and all:  $3(-2)^2 - 2(-2) + 5$ . Square first — the parens keep the negative on the base, so  $(-2)^2 = 4$  and  $3(4) = 12$ . The middle term flips sign:  $-2(-2) = +4$ . Add the constant:  $12 + 4 + 5 = 21$ .
- Top:  $5 + 3 = 8$ . Bottom:  $5 - 3 = 2$ . Then  $\frac{8}{2} = 4$ . Finish the top and bottom before dividing.
- Inside the bars first:  $3(-1) - 4 = -3 - 4 = -7$ . Absolute value:  $|-7| = 7$ . Add:  $7 + 2 = 9$ .
- Start with the key idea: Top:  $5^2 - 9 = 25 - 9 = 16$ . Bottom:  $5 + 3 = 8$ . Then  $\frac{16}{8} = 2$ . This is the part to check before moving on, because it keeps the answer tied to the original question.
- Parens first:  $1 + 0.05 = 1.05$ . Exponent:  $(1.05)^2 = 1.1025$ . Multiply:  $1000(1.1025) = 1102.50$ . (The compound interest formula — a year-end balance after two years at 5%.)
- That first term is the tricky one.  $-(-2)^2 = -(4) = -4$  — the exponent grabs the  $-2$  inside the parens, and the *leading* negative sits outside. Next:  $4(-2) = -8$ . Combine:  $-4 - 8 - 7 = -19$ .
- One steady path is:  $(1.5)^2 = 2.25$ . Then  $-16(2.25) = -36$ . So  $60 - 36 = 24$  feet. (A ball dropped from 60 ft after 1.5 seconds.) That gives a quick check on the answer.
- Replace  $x$  with  $(2)$  everywhere:  $3(2)^2 - 2(2) + 1$ . Exponent before multiplying:  $(2)^2 = 4$ , so  $3(4) = 12$ . Then  $-2(2) = -4$ . Combine left to right:  $12 - 4 + 1 = 9$ .
- Zero kills the first two terms:  $f(0) = 0 - 0 + 1 = 1$ . (The  $y$ -intercept is always  $f(0)$ .)
- Keep the rule visible:  $3(-2)^2 - 2(-2) + 1 = 3(4) + 4 + 1 = 12 + 4 + 1 = 17$ . Note the middle term flipped sign and became positive. That gives a quick check on the answer.
- Substitute with the input in parentheses:  $f(3) = 3(3)^2 - 2(3) + 1 = 3(9) - 6 + 1 = 27 - 6 + 1 = 22$ . The table values line up with the same rule (for instance  $f(2) = 3(4) - 4 + 1 = 9$ ), so  $f(3) = 22$  continues it.
- Start with the key idea:  $(1.5)^2 = 2.25$ . So  $-12(2.25) = -27$  and  $36(1.5) = 54$ . Combine:  $-27 + 54 + 18 = 45$  feet. That gives a quick check on

the answer.

13. A careful way to see it: Top:  $2(-4)^2 - 3(2) = 2(16) - 6 = 32 - 6 = 26$ . Bottom:  $-4 + 2 = -2$ . Then  $\frac{26}{-2} = -13$ . That gives a quick check on the answer.

14. First term:  $2(-2)^2 = 2(4) = 8$ . Middle:  $-3(-2)(4)$ : two negatives give  $+24$ . Last:  $(4)^2 = 16$ . Sum:  $8 + 24 + 16 = 48$ .

15. Plug in:  $f(2) = 2^2 - 5(2) + 6 = 4 - 10 + 6 = 0$ . So the input 2 maps to 0 — meaning  $x = 2$  is a zero of this quadratic. (Notice 1 and 4 both land on 2, which is fine for a function.)

16. Substitute:  $f(3) = 3^2 - 5(3) + 6 = 9 - 15 + 6 = 0$ . So  $x = 3$  is a zero (this quadratic factors as  $(x - 2)(x - 3)$ , so both 2 and 3 give 0).

17. Differences:  $4 - 1 = 3$ ,  $6 - 2 = 4$ . Square each: 9 and 16. Sum: 25. Square root:  $\sqrt{25} = 5$ . (A 3-4-5 right triangle in disguise.)

18. Keep the rule visible: Inside the bars:  $7 - 3 = 4$ . Then  $|4| = 4$ . Multiply and add:  $2(4) + 1 = 9$ . That gives a quick check on the answer.

19. One steady path is: Top:  $8 + 1 = 9$ . Bottom:  $2 + 1 = 3$ . Then  $\frac{9}{3} = 3$ . This is the part to check before moving on, because it keeps the answer tied to the original question.

20. Start with the key idea:  $9 + 2(3)(-1) + 1 = 9 - 6 + 1 = 4$ . (Notice this is  $(x + y)^2$  in disguise:  $(3 + (-1))^2 = 2^2 = 4$ .) That gives a quick check on the answer.

21. Square the time first:  $(1.5)^2 = 2.25$ . Then multiply:  $-16(2.25) = -36$ . Add to the starting height:  $60 + (-36) = 24$  feet. The ball has fallen from 60 feet down to 24 feet — 36 feet in a second and a half.

22. Parens first:  $1 + 0.05 = 1.05$ . Now the exponent:  $(1.05)^2 = 1.1025$ . Multiply by the principal:  $1000(1.1025) = 1102.50$ . So the account holds \$1,102.50 after two years. (Skipping the exponent gives \$1,050, which is only one year's interest — a common slip.)

23. Square first:  $(1.5)^2 = 2.25$ . Quadratic term:  $-12(2.25) = -27$ . Linear term:  $36(1.5) = 54$ . Constant: 18. Add:  $-27 + 54 + 18 = 45$  feet.

24. Wrap each value in parentheses. Numerator:  $2(-4)^2 - 3(2) = 2(16) - 6 = 32 - 6 = 26$ . Denominator:  $-4 + 2 = -2$ . Divide:  $\frac{26}{-2} = -13$ . The negative comes from the denominator alone.



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